

Claims

1. A linear measuring device for measuring the relative position of a first machine element (7) with respect to a second machine element (8), having
 - a housing (3, 30), which can be fastened to the first machine element (7),
 - a scale (1, 200) within the housing (3, 30), wherein the scale (1, 200) is fastened extending along the housing (3, 30) in the measuring direction (X),
 - a scanning device (2) for scanning the scale (1, 200),
 - a linear guide device with a guide rail (31), which is rigidly assigned to the housing (3, 30), and with a guide carriage (10), which supports the scanning device (2) and is guided on the guide rail (31) along the housing (3, 30) in the measuring direction (X), wherein
 - the guide carriage (10) is connected to the guide rail (31), free of play in all directions Y, Z perpendicularly with respect to the measuring direction X,
 - the housing (3, 30) is designed in such a way and can be fastened to the first machine element (7), so that during measuring operations it can be deflected perpendicularly with respect to the measuring direction X at least in the guide area, so that in the course of a movement of the guide carriage (10) perpendicularly with respect to the measuring direction X the housing (3, 30) is taken along in this direction, and
 - the guide carriage (10) has fastening means (9) with which it can be fastened rigidly on the second machine element (8) in the measuring direction X and in all directions Y, Z perpendicularly with respect to the measuring direction X.
2. The linear measuring device in accordance with claim 1, characterized in that the guide rail is constituted by an exterior face (31) of the housing.
3. The linear measuring device in accordance with claim 2, characterized in that the housing (3, 30) is tube-shaped and has a circular-cylindrical

circumferential area as the guide area (31) of the guide rail, wherein the guide carriage (10) is guided on the guide area (31), free of play and with a degree of freedom in the measuring direction X, as well as with a rotary degree of freedom around the longitudinal axis of the housing (3, 30).

4. The linear measuring device in accordance with one of the preceding claims, characterized in that the scanning device (2) is rigidly connected with the guide carriage (10) in the measuring direction X and in all directions Y, Z perpendicularly thereto.

5. The linear measuring device in accordance with one of the preceding claims, characterized in that the scale (1, 200) has a measuring structure (110), which can be photo- electrically scanned, and the scanning device (2) has at least one light source (21) and a light-sensitive detector (22).

6. The linear measuring device in accordance with one of the preceding claims, characterized in that the scale (1, 200) is arranged inside the housing (3, 30), and the scanning device (2) has at least one light source (21) and a light- sensitive detector (22) outside of the housing (3, 30) for scanning the scale (1) by means of a light beam through the housing (3, 30), for which purpose the housing is transparent to the scanning light bundle at least in the circumferential scanning area (A).

7. The linear measuring device in accordance with one of the preceding claims, characterized in that the scale (1) is fastened on an interior wall (32) along the housing (3).

8. The linear measuring device in accordance with claim 7, characterized in that the scale is a linearly rigid steel tape (1) of low flexural strength.

9. The linear measuring device in accordance with one of the preceding claims, characterized in that the housing (3) is linearly rigid and has flexural strength.

10. The linear measuring device in accordance with claim 9,
characterized in that the housing (3) has at least one mounting element (5, 6) with a
connecting element (51, 61), by means of which it can be fastened on the first
machine element (7) so that it can be deflected perpendicularly with respect to the
measuring direction X.

11. The linear measuring device in accordance with claim 10,
characterized in that the connecting element (51) at one end of the housing (3)
connects the housing (3), linearly movable, with the mounting element (5), and the
connecting element (61) at the other end of the housing (3) connects the housing (3)
rigidly in the measuring direction X with the mounting element (6).

12. The linear measuring device in accordance with one of the preceding
claims 1 to 8, characterized in that the housing (30) is linearly rigid and has low
flexural strength.